MuniWireless

June 2006
Issue 002

The Voice of Public Broadband
www.muniwireless.com

Innovation.

Breakthrough Uses of Public Broadband

Finding the Truth in St. Cloud

Corpus Christi: Portrait of a Pioneer

Why WiFi is *Not* Hazardous to Your Health

How WiMAX Fits into Municipal Networks

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reality, please.

When St. Cloud's municipal wireless broadband network went live in March 2006, this central Florida city became the first in the world to offer free Internet access. Articles online and in print gushed over St. Cloud's vision and audacity.

Two months later, the headlines were anything but congratulatory: "Pioneering City Sees Muni WiFi Woes" screamed the headline from an Associated Press article that found its way around the world. "I told you so," declared municipal broadband foes everywhere.

The reality is more complicated than that. The AP article focused on a few individuals who had trouble logging onto the network. However, if you look at the statistics—93 percent of those surveyed were satisfied with the network—St. Cloud's free Internet access isn't a debacle but a success.

As communities with larger population densities and more challenging topographies—San Francisco for example—deploy city- and countywide networks, expect to see the same sensationalist headlines about poor reception and dropped connections. Sound familiar? These are the same complaints that users of mobile phones have been making for more than a decade. Yet, no one suggests that cellular technology is a failure; nor are users eager to drop their subscriptions.

One must always keep in mind the immense economic advantage that WiFi—with its use of unlicensed spectrum and open standards—has over competing wireless and wired technologies. There is no reason to believe that any difficulties encountered by today's WiFi equipment and software will not be solved within a very short period.

While St. Cloud's network deployment went as smoothly as anyone could hope for, other deployments may not. St. Cloud is a small city of 28,000 people. It is fairly homogenous and flat. San Francisco, by contrast, has more than 750,000 people who live in a damp, foggy region known for its steep hills and deep valleys. Rolling out a network in San Francisco is more than just physically challenging: Because of the diverse population and the number of special interest groups that pull the mayor and the city council from all sides, building a network that makes everyone happy will be almost impossible. Yet, San Francisco has decided to try, together with its partner EarthLink, because it recognizes the importance of having inexpensive citywide wireless broadband access, especially for low-income families who have been left out of the digital economy. Many cities and counties have come to the same conclusion. And, in addition to providing inexpensive Internet access, they also realize that a wide-area wireless broadband network can make local government more efficient and responsive.

Although equipment vendors and service providers rarely talk about deployment problems, we need to anticipate delays in rolling out these large complex networks, as well as weak signals and dropped connections. Opponents of these deployments—many of whom come from companies whose business models are threatened by large-scale WiFi networks offering cheap access—will use every complaint to convince local government officials, investors and citizens that these networks are a massive failure. But wherever there are opponents of citywide WiFi, there are many who champion it for social and financial reasons.

No one has ever built WiFi networks on this scale before, but like anything else in technology, the more they get built, the more we learn and the better we can build them. As more people find uses for these networks, their value will only increase, driving even more innovation and investment. St. Cloud is only the start, and a good one at that. Let's allow the users—not the press or premature prophets of doom—to decide whether or not municipal wireless broadband networks are worthwhile. MW

Esme Vos

—Esme Vos, Founder
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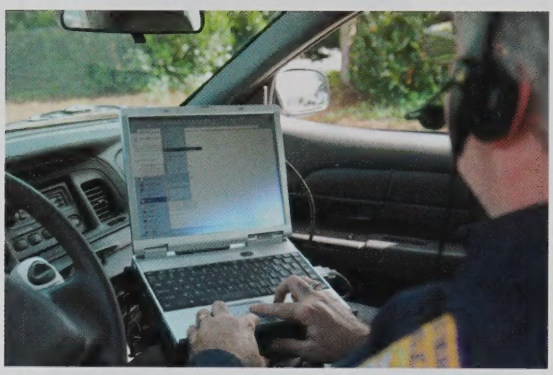

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COVER STORY

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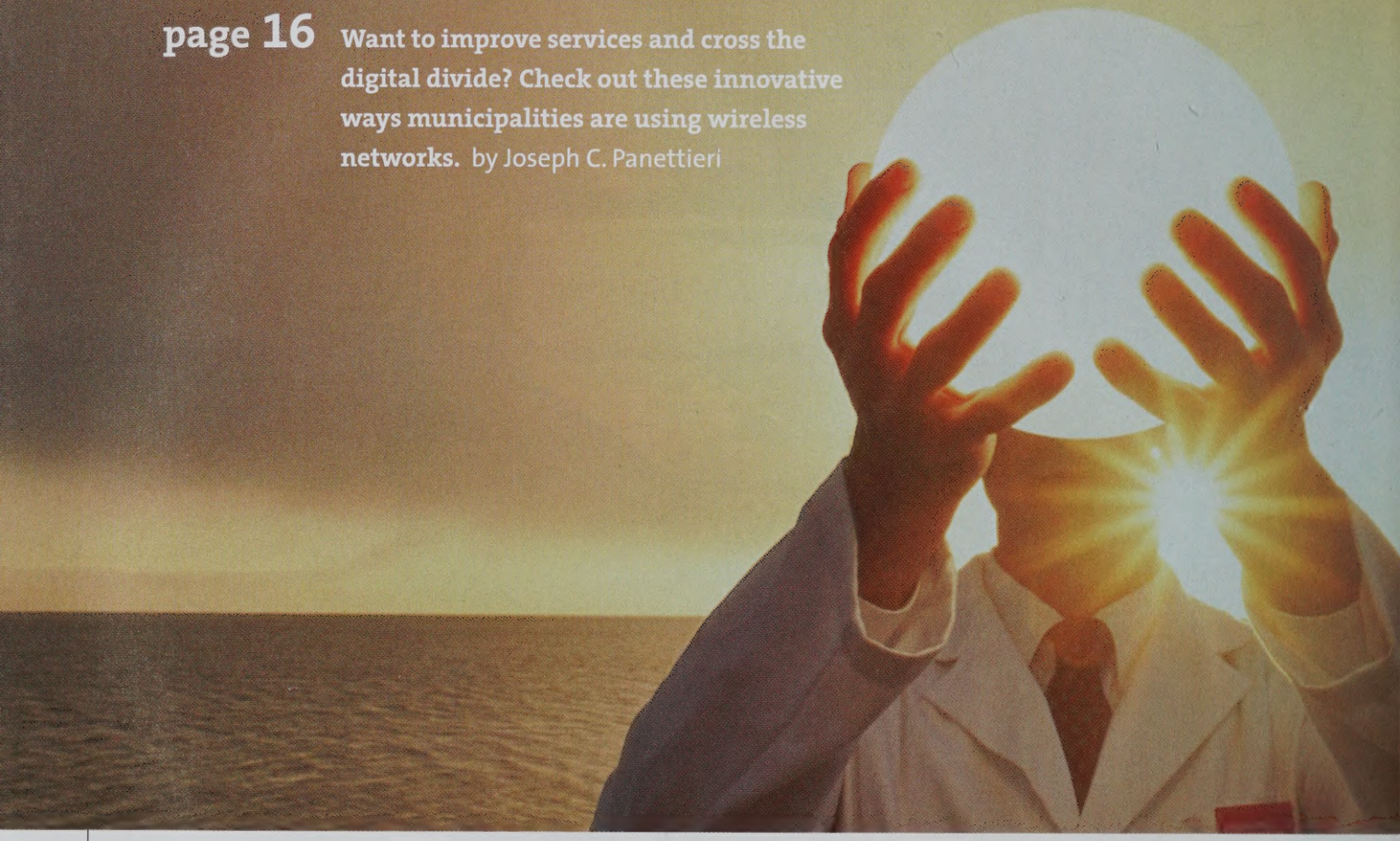
page 16 **Want to improve services and cross the digital divide? Check out these innovative ways municipalities are using wireless networks.** by Joseph C. Panettieri



TO OUR READERS:

Thank you for the overwhelmingly positive response to the Preview issue of *MuniWireless Magazine*, which we published in March. It's been rewarding and gratifying to feel such strong encouragement from the community. We hope you are equally enthused by this issue.

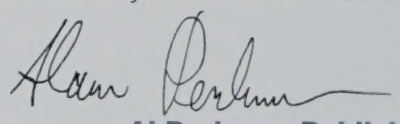
For our cover story, we continue to write about applications: Last issue it was public safety, this time our focus is on innovations. We are constantly being asked, online and at our conferences, to find and spotlight those applications that are driving the successful deployments of municipal wireless.

Clearly, muniwireless is not a movement driven by technology, but by how the technology can help individuals and communities improve their quality of life. We also have features this issue focused on the long-awaited arrival of WiMAX technology; the ground-breaking muniwireless deployment in Corpus Christi; and the health impacts—or lack thereof—of WiFi networks.

Among other things, it is my additional task to remind you that *MuniWireless Magazine* is the print companion to the Web site MuniWireless.com and that the magazine is offered free to qualified subscribers. To ensure continued delivery of the magazine, you must complete a subscription form.

Forms are available online at www.muniwireless.com/magazine. There are also two subscription forms in the magazine, following pages 10 and 34. If you prefer, you can fill out one of these and send it by postal mail. Please feel free to pass on a subscription card (and the e-mail address) to colleagues.

We look forward to your continued feedback, and we hope to see many of you at our upcoming conference June 19-21 at the Marriott Santa Clara in Silicon Valley. If we don't see you live at the Santa Clara event, we're sure to see you online at www.muniwireless.com. As always, please feel free to send comments and suggestions directly to me at al@muniwireless.com.



—Al Perlman, Publisher

p.8 TRENDS
the real St. Cloud: Negative press aside, the nation's first free deployment is well on the way to success

hope in Latin America: What kind of WiFi access is in your area?

running on broadband: In New York, a top politician pushes for universal access

free vs. paid: What are the real issues?

p.24 TECHNOLOGY: Here comes WiMAX

p.30 DOSSIER: Corpus Christi: Portrait of a pioneer

p.36 ISSUES: Why WiFi is *not* hazardous to your health

p.41 MARKET MAP
Gary A. Bolles: It's time for the incumbents to stop obstructing and start participating

p.42 ADVOCATE
Harold Feld: What's wrong with this legislation?

MuniWireless
The Voice of Public Broadband

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MuniWireless Magazine (ISSN 1930-1081) is published quarterly by MuniWireless LLC in association with Microcast Communications Inc., 2417 Jericho Turnpike #109, Garden City Park, NY 11040; phone 516•352•7808; fax 516•352•7816.

This publication is free to qualified subscribers as determined by the publisher. Subscription inquiries should be directed to the Circulation Department, *MuniWireless Magazine*, 2417 Jericho Turnpike #109, Garden City Park, NY 11040.

Please note that changes of address require that a new application be filled out completely. Please allow 4-6 weeks for processing.

Postmaster: Please send address changes to *MuniWireless Magazine*, 2417 Jericho Turnpike #109, Garden City Park NY 11040. One year paid subscription rates are $40.00 U.S., $48.00 Canada and $60.00 International. Single-copy price is $10.00 U.S. All content in this publication is © 2006 MuniWireless LLC.

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FREE DOWNLOADS

June 2006 List of U.S. Cities and Regions. This is the latest update to our free July 2005 market report. It includes 59 cities and regions with muniwireless implementations; 32 city hotzones; 35 public safety and municipal-use only networks, and 121 citywide or countywide projects that are either in the deployment phase or the RFP stage; and 17 cities and counties that are considering WiFi.

RFP Heaven. This is an assemblage of requests for proposals from various municipalities for their city wireless broadband projects.

WEB SEMINAR

We've just posted our first Web seminar, entitled "Strategies for Public Safety Networks." This is available now to download. For this and more webcasts, go to www.muniwireless.com/webcasts.

FEATURE SECTIONS

Municipal Wireless: Regulatory projects, policies and legislation

Community: Social relevance and impact on everyday life

Applications: Practical implementations of wireless at work

Technology: News, information and recent developments

CONFERENCES

MuniWireless 06: Silicon Valley
June 19-21, Marriott Santa Clara

MuniWireless 06: Midwest
Oct. 23-24, Marriott Minneapolis City Center

REGIONAL ROUNDTABLES

Deploying Muniwireless, July 13, Hyatt Regency, Long Beach, CA

the real st. cloud

Despite negative media attention, the nation's first free wireless network is an unqualified success

by Esme Vos

IN MARCH, THE CITY OF ST. CLOUD, FLA., a community of 28,000, launched the first citywide wireless broadband network that offers free internet access to residents and businesses. Called *Cyber Spot*, the new service found itself on the front pages of online tech journals as well as mainstream print publications.

But good news doesn't last, especially since bad news sells better. Within a month and a half, St. Cloud went from model city to city in crisis. With screaming headlines such as "Pioneering City Sees Muni Wifi Woes" (the original Associated Press article, which found its way into many newspapers), the mainstream press took a few isolated reports of weak signals and sensationalized them into a major tech catastrophe. And the anti-municipal broadband crowd concluded that municipal WiFi was a disaster.

But is it? Let's look at the statistics from St. Cloud. Unlike commercial ISPs, the city gathers and publicizes data on the number of registered users, session lengths and calls logged to the help line, among other things. And it sends out surveys to find out what users think of the network.

For a muni WiFi "disaster," St. Cloud is doing very well. Sixty days after the launch of the network, 4,300 households (42 percent) had registered and the number of calls (1,100) made to the help desk run by Hewlett-Packard was three to five times lower than expected. The results of a survey[1] sent out by the city show that 93.9 percent of respondents were supportive of the city's free WiFi service. Other results from the survey indicate that most people are satisfied with the network (see box opposite page).

You'd think that the deployment of a citywide WiFi network—considered by many to be in the experimental stage—would flood the HP call center and provide lucrative business opportunities to local tech entrepreneurs. This has not been the case.

Michael Pitcher, president of Sunshine PC Solutions (a company that provides onsite service to users and is not part of the free support provided by the city through HP) says, "We have only had to service 51 people thus far, with 100 percent satisfaction. Typically, at the optimization and tuning phase of a network, we would expect to make service calls to about 7 to 10 percent of users. So, we were geared up for 250 to 350 service calls. This has not happened."

Wade Davis, St. Cloud council member, adds, "The vast majority of users are telling us that the service is valuable and is working for them. They clearly recognize the importance of *Cyber Spot* to the economic and social prosperity of their families and the community."

Cyber Spot user Dr. Jay Cullinane, a St. Cloud chiropractor, says, "I have been using *Cyber Spot* at home for about a month. Set-up was easy and the access has been fast and reliable. I started using *Cyber Spot* at my office last week. This will save me a considerable amount of money now that I have canceled my DSL service."

Just how much money could St. Cloud's free wireless network save residents and businesses? An average of $438 per year for residents and $755 per year for businesses, according to estimates from project participants.

Jonathan Baltuch, president of MRI, the company that created the *Cyber Spot* initiative for St. Cloud, says that community education was instrumental in getting users online as quickly as possible. Numerous community workshops and full-page newspaper ads taught users about logging on, the need for wireless bridges (to amplify weak signals),

If he were advising another city, Johnathan Baltuch, president of MRI, would recommend launching the network in test mode for three to four months.

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and other technical details. Indeed, St. Cloud's problem may not be that people can't use the network, but that it is too popular, even among those who do not live or work within the official boundaries of the city. St. Cloud does not make any promises of access to people outside the city.

"During our weekly conference call with the city, we drilled down to a couple of user calls placed directly to the city's offices," says Baltuch. "One of the users complained that he had contacted the help desk three or four times and that he was still having problems connecting. We searched the help desk's database and could not find any record of the user's name, address or phone number. After further investigation and mapping of this business's address, we realized that the company is *not* in the city limits."

When asked if there were any surprises, Baltuch says that the city had instructed HP to prepare to handle a call volume that was three to five times more than what they had actually received. In addition, the number of registrations—4,300 in 60 days—was significantly higher than expected. However, Baltuch remains perplexed by the small but significant number of people who did not realize that citywide WiFi was available, or were confused about the network. He says that after 12 workshops and 24 full-page ads, they fell short of reaching 100 percent of the population. Still, he believes that the city's effort to educate its residents about the network was worthwhile.

If he were advising another city, Baltuch says that aside from educating residents and businesses, the city should launch the network in test mode for three to four months. This allows the city to have a network that is fully operational but in "soft mode" to enable network engineers to optimize it before going live officially—much like a restaurant.

A Network's Success Depends Upon Meeting Users' Needs

As we have seen from St. Cloud's experience, failure is in the eye of the beholder. Are cell phone networks a failure because close to half of the respondents to the St. Cloud survey found them less reliable than St. Cloud's network? People continue to use cell phones and pay for cellular service even though they encounter dead spots and experience dropped calls.

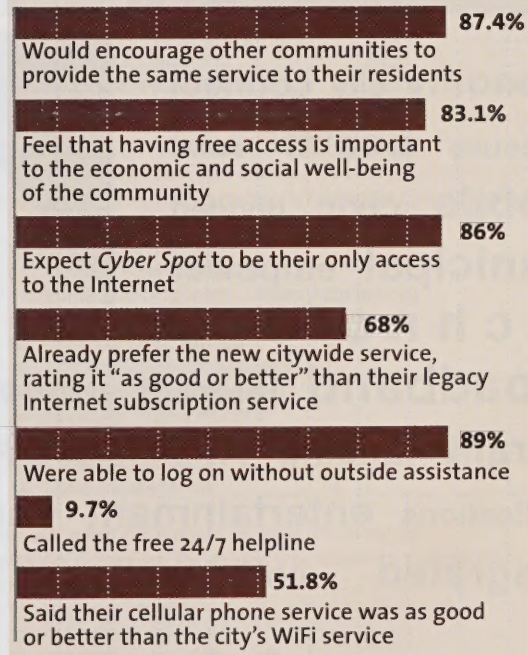
Users weigh the benefits of any service against its cost—not just the actual out-of-pocket cost of the service, but also in how difficult it is to use (the hassle factor). Networks —whether they are WiFi or cellular—are also "alive." They evolve. Network operators upgrade their equipment, perform software updates and replacements, resolve bugs, increase bandwidth and deliver additional services. As end users find more applications for the network, operators upgrade the network to meet their needs. A network that reacts quickly to the needs of its users will, over time, be perceived as much more useful and therefore "successful."

This is the appeal of municipal wireless broadband networks that operate in unlicensed spectrum. Their users have access to the Internet and therefore to any application made available on it. Unlike a cellular network, which is a walled garden controlled by one operator, nobody needs to ask permission to make his application available to other users on the Internet. Skype's creators did not have to ask permission to distribute their application to thousands of users around the world. They just made it available as a download.

As these municipal networks become more common and their coverage expands beyond the city, they will be the network of choice for not just for Internet access, but for voice and government applications as well. MW

The People Have Spoken

Here are the results from St. Cloud's survey of residents. There were 3,386 surveys delivered and 901 responses, for a 26.6% response rate:


87.4%
Would encourage other communities to provide the same service to their residents
83.1%
Feel that having free access is important to the economic and social well-being of the community
86%
Expect *Cyber Spot* to be their only access to the Internet
68%
Already prefer the new citywide service, rating it "as good or better" than their legacy Internet subscription service
89%
Were able to log on without outside assistance
9.7%
Called the free 24/7 helpline
51.8%
Said their cellular phone service was as good or better than the city's WiFi service

[1] The city sent out the survey to 3,623 e-mail addresses (237 bounced). Out of 3,386, they received 901 responses or 26.6% response rate (margin of error +/- 3%).

competition opposition **freedom** healthcare transportation environment **infrastructure** **innovation** safety **complexity** education choice **affordable** inclusion **community** investment **citizens** **wireless** risk urban employment **e-government** neighborhood

economy city connect pressure **social** rural **mobile** civic divided **municipal** empower **technology** **broadband** interact universal dynamic vibrant funding **RFP** **partnership** tourism applications **entertainment** visitors **creative** integrated collaboration **stakeholders**

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Title_____

Organization_____

Phone Number_____

Business Address _____

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Zip/Postal Code_____

1. What is the primary activity of your organization? (select one only)

- ☐ 01 Municipal Government (Town, City, County, or other local or regional)
- ☐ 02 State Government
- ☐ 03 Federal Government
- ☐ 04 Telecommunications Service Provider
- ☐ 05 Internet Service Provider
- ☐ 06 Wireless Internet Service Provider
- ☐ 07 Value-Added Reseller/Systems Integrator
- ☐ 08 Hardware/Software Manufacturer
- ☐ 09 Consultant
- ☐ 10 Education
- ☐ 11 Media
- ☐ 12 Investment/Financial
- ☐ 13 Lobbyist
- ☐ 14 Community Advocate
- ☐ 15 Other (please specify)_____
- ☐ 16 None of the above

2. What is your primary job function? (select one only)

Information Technology

- ☐ 17 CIO, CTO, CSO
- ☐ 18 VP/EVP/Director of IS
- ☐ 19 Network Manager, Telecommunications Manager
- ☐ 21 Engineering Manager
- ☐ 22 Other Information Technology Management
- ☐ 23 Information Technology Staff

Government

- ☐ 24 Elected Official (Mayor, Council Member, e.g.)
- ☐ 25 Non-Elected Official (Police/Fire Chief, Building Inspector, e.g.)
- ☐ 26 State/Local Regulator
- ☐ 27 Federal Regulator

Business

- ☐ 28 Chairman, CEO, President, Owner, Principal Partner
- ☐ 29 Controller, Treasurer, CFO
- ☐ 30 Vice President, General Manager
- ☐ 31 Technical, Engineering
- ☐ 32 Marketing, Sales
- ☐ 33 Other Business

Influencers

- ☐ 34 Consultant
- ☐ 35 Analyst/Financial Investor
- ☐ 36 Journalist

- ☐ 37 **Other** (please specify)_____

3. If you are with a municipality, what is the status of your municipality's broadband wireless network? (select one only)

- ☐ 38 Already up and running
- ☐ 39 Plan to install within the next year
- ☐ 40 Plan to install within two years
- ☐ 41 Plan to install with no time frame
- ☐ 42 Thinking about it, but no specific plan to install
- ☐ 43 Other (please specify)_____

4. What is the approximate population of the community the network serves/will serve? (select one only)

- ☐ 44 More than 1 million people
- ☐ 45 500,000 to 1 million
- ☐ 46 250,000 to 499,999
- ☐ 47 100,000 to 249,999
- ☐ 48 50,000 to 99,999
- ☐ 49 25,000 to 49,999
- ☐ 50 10,000 to 24,999
- ☐ 51 Less than 10,000

5. What technologies/platforms/services are you using and/or considering for your municipal broadband network implementation? (select all that apply)

	Using	Considering
52 Mesh Networks	A ☐	B ☐
53 WiMax	A ☐	B ☐
54 Security Products	A ☐	B ☐
55 Customer Premises Equipment	A ☐	B ☐
56 Back Office Equipment	A ☐	B ☐
57 Consulting Services	A ☐	B ☐

58 Other (please specify)_____

6. What applications are you using and/or considering for your municipal broadband network? (select all that apply)

- ☐ 59 Public Safety
- ☐ 60 Education/Training
- ☐ 61 Asset Tracking/SCADA (Supervisory Control + Data Acquisition)
- ☐ 62 Building Inspection
- ☐ 63 Utilities/Public Works
- ☐ 64 Hospitality/Visitor Services
- ☐ 65 Residential Public Access
- ☐ 66 Business Public Access
- ☐ 67 Homeland Security
- ☐ 68 Disaster Recovery
- ☐ 69 Other (please specify)_____

7. Approximately how much is your municipality planning on spending for municipal wireless networks in the next 12 months? (select one only)

- ☐ 70 less than $10,000
- ☐ 71 $10,000 to $24,999
- ☐ 72 $25,000 to $99,999
- ☐ 73 $100,000 to $499,999
- ☐ 74 $500,000 to $999,999
- ☐ 75 $1 million to $2,499,999
- ☐ 76 $2.5 million to $4,999,999
- ☐ 77 $5 million or more
- ☐ 78 None of the above

8. What is the scope of your purchase authority for your installed or planned municipal broadband networks? (select all that apply)

- ☐ 79 Approve purchases
- ☐ 80 Approve vendors
- ☐ 81 Evaluate vendors
- ☐ 82 Prepare/write RFPs
- ☐ 83 Recommend requirements
- ☐ 84 Recommend vendors
- ☐ 85 None of the above

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latin america and the digital divide

Muni wifi offers hope in disadvantaged areas by Esme Vos

REGIONS THAT COULD REALLY USE wide-area wireless broadband networks—because they are cheaper to build and upgrade than wired networks—are also often the ones that deploy them the least. I wanted to know the barriers to municipal WiFi in Latin America—as well as the opportunities—so I posed several questions to **Oscar Matallana, a systems technician from Chiquinquira, Colombia**, and **Alberto Garcia Carmona, a lawyer in Buenos Aires, Argentina.** Both are helping municipalities go wireless. Oscar and Alberto are avid readers of MuniWireless.com and closely follow developments in this area.

Q. What are the difficulties in building a citywide WiFi network in your country?

Oscar (Colombia): Funding. Equipment is expensive, so few can afford to set up a wireless broadband network. The lack of experience among service providers is also a barrier. On the other hand, the national government is trying to make it easier for companies to deploy wireless broadband networks by easing regulations governing ISPs (Internet service providers).

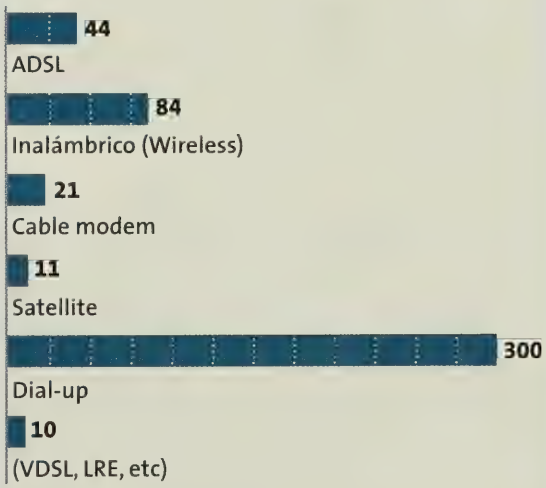
Alberto (Argentina): We are still in the early stages of municipal WiFi. There is interest in small communities, where access to broadband is difficult to find. As in other countries in Latin America, the dominance of ISPs owned by incumbent telecom operators is a significant barrier to entry for smaller service providers who want to roll out citywide WiFi networks. With regard to legislation, a few legislators have been informed of certain projects going on around Argentina, but no legislation addressing municipal wireless exists. Argentine Vice President Daniel Scioli and the president of our senate are very enthusiastic about municipal wireless networks and digital cities in general.

Q. Are municipal officials in your country making plans for municipal wireless networks? Are national government officials pushing for muni WiFi?

Oscar: The government in Colombia is helping the private sector by facilitating procedures for obtaining an ISP license. The government is also running a program called "broadband connectivity for all the public institutions" that is directed to all the government offices, public schools and public hospitals. The purpose is to bring Internet connectivity to all areas—in some places even via satellite broadband access.

Alberto: A few municipal officials have shown interest, but others are completely unaware that this is possible. There is a clear digital divide: larger cities have much better access to broadband, smaller cities don't. We are trying to educate them through the Argentina Municipal Federation, helping them to locate three or four leading cities to help educate the others and to showcase their communities as examples. We are also organizing local seminars. One of the most important seminars will be held in September or October this year in Buenos Aires with local leaders, mayors, legislators, businesspeople, telcos, and tech companies.

Number of ISPs in Argentina

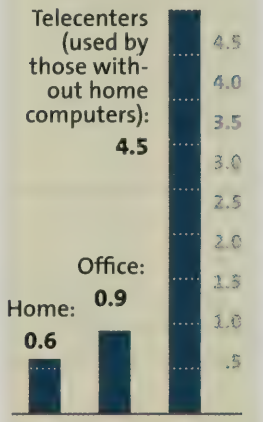


Source: Alberto Garcia Carmona

Q. What is Internet access like in your country? Do most people connect via DSL or cable?

Oscar: Here in Colombia there are many providers. In the largest cities, people have access to ADSL and cable. In medium-sized cities, most

Total Broadband Connections, Cable and ADSL in Argentina (in millions)



Source: Alberto Garcia Carmona

people are on dial-up. And in small towns, they have satellite broadband. Broadband penetration is very low in the medium-sized and smaller cities and towns because the service is very expensive.

Alberto: Here are some statistics. There are 7.5 million users out of a total population of 38 million (2005 data). Of that 7.5 million, 30 percent access the Internet through their homes, 60 percent through public telecenters and 10 percent through their work/schools/universities.

Q. How serious is the digital divide in your country? Do most schools have Internet access?

Oscar: Few schools have any Internet access at all because it is very expensive—especially those in small towns, where access is through a satellite connection.

Alberto: The digital divide is significant because a lot of low income people cannot afford computers or a broadband connection. Most schools do not have Internet access. In terms of a geographical digital divide, broadband deployment is concentrated in Buenos Aires and its suburbs.

SUMMARY: As we have seen from Oscar's and Alberto's responses, the barriers to entry that many Latin American countries face are also present in the U.S., Europe and Asia. Expensive equipment, high prices for broadband connections and computers, regulatory barriers, local incumbent power and even ignorance among local political leaders keep citizens away from the Internet. As prices for equipment come down and government officials become aware of the benefits of municipal wireless broadband networks, there will be more pressure to deploy these networks, even in rural areas. **MW**

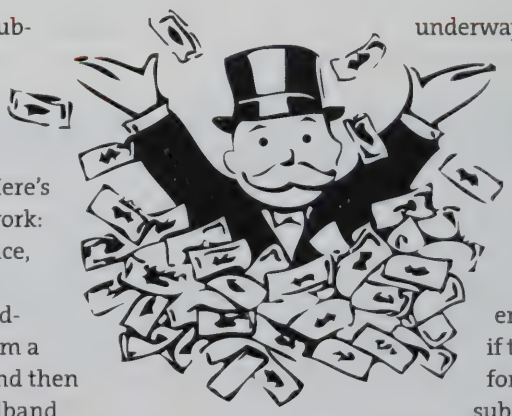
what's a muni to do?

Free business models bring new options, new opportunities and, for municipalities, new questions

by Joseph C. Panettieri

GOOGLE SURPRISED MANY in the municipal wireless market: First with its interest, then with its aggressive approach to San Francisco, where it is partnering with EarthLink, and Mountain View, Calif., where it is spearheading the network deployment. Google's participation sparked a free-versus-paid debate that is causing municipalities all over the world to examine and potentially re-evaluate their business models.

Well, guess what? The muniwireless industry may be in for a few more Google-like surprises. From Apple Computer to Nintendo to Sony, gaming vendors and mobile device makers may be among the next group of consumer-oriented companies to subsidize future broadband networks, industry watchers say. Here's how it might work: Sony, for instance, could purchase wholesale broadband access from a municipality and then offer free broadband service to mobile gamers who pay a monthly fee to play the latest interactive videogames, download Sony music and watch streaming Sony movies.



Though still early, the trend is underway in Europe. Orange UK, the mobile phone operator, is offering free broadband service to its UK-based subscribers—but only if they sign up for an 18-month subscription of £30 or more per month. The company is throwing in a wireless modem and VoIP to jumpstart the program. Vodaphone has a similar free broadband offer in Germany.

In the United States, Google's

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deployment in Mountain View will take a similar approach. Rather than providing WiFi coverage to homes, Google is striving to blanket parks, businesses and libraries with the free service, according to Minnie Ingersoll, product manager for Google WiFi. During a small Silicon Valley technology event in April, Ingersoll said Google had already deployed roughly 350 Tropos Network units around Mountain View.

"Kids growing up today expect free Web browsers, free messaging and free applications. It's only natural that they would come to expect free Internet service."

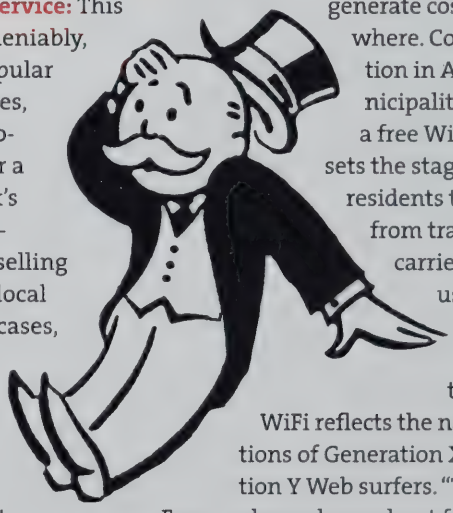
Know Your Options

Still, not every city has a rich uncle, like Google, that's willing to fund public broadband initiatives, and, for most municipalities, there are pros and cons involved with all of the current business models. Here's a sampling:

• **Monthly fee-based broadband service:** Subscription-based municipal WiFi service typically costs users $19 to $25 per month. On the upside, the steady revenue stream allows municipalities to consistently upgrade service as faster bandwidth standards emerge. However, the subscription-based model can also limit user adoption. After all, residents are already juggling monthly phone, cable and Internet connection fees. A separate broadband bill from a municipality—or a service provider managing the municipality's network—may seem like more trouble than it's worth.

• **Advertiser-driven broadband service:** This approach parallels business models pioneered by open source software developers. Opera, for instance, is a popular Web browser that has a small window for displaying rotating ads. Those who use the browser for free see the ads; those who pay an annual subscription receive a version of the browser without the advertising window. An advertiser-funded broadband service goes one step further, delivering localized ads. For instance, local companies—real estate brokers, auto dealers, and so on—can use the service to promote their goods to local residents. Still, advertiser-driven services have their downside. Municipalities must find a savvy sales organization to sell ads and manage client relationships. Moreover, municipalities must somehow manage advertiser pushback if the broadband network doesn't achieve critical mass.

• **Free broadband service:** This third option is, undeniably, an increasingly popular choice. In some cases, Internet service providers (ISPs) pay for a municipal network's rollout and maintenance, in hopes of selling add-on services to local residents. In other cases, the municipality foots the bill through government grants or by re-allocating funds from other projects. Free networks also come with risks. Choose the wrong ISP partner, and a municipality could wind up with a broadband service that doesn't meet customers' performance or service expectations.



With all these considerations in mind, municipalities from Mountain View to Philadelphia to Miami Beach are increasingly opting to offer free WiFi service. Philadelphia's City Council in May approved a contract that will blanket the city with free WiFi service. The network, to be built and operated by EarthLink at no cost to the city, faced strong opposition from incumbent cable and telephone companies that already offer paid broadband service. Work on the network will begin this summer, with a complete rollout expected by mid to late 2007, according to an EarthLink spokesman.

In Miami Beach, the City Commission approved a plan in March to become Florida's first major city to offer free broadband Internet service. IBM Corp. will build and maintain the $5 million network, with initial service coming online shortly.

While free networks can be expensive to build, municipalities and their residents expect the WiFi systems to generate cost savings elsewhere. Consider the situation in Aurola, Ill. The municipality is building out a free WiFi network that sets the stage for tech-savvy residents to move away from traditional phone carriers and instead use free or low-cost VoIP services. Ultimately, the move to free WiFi reflects the natural expectations of Generation X and Generation Y Web surfers. "The Internet has always been about freedom, and in many ways, free services," notes Chellappa Kumar, CIO of the New York College of Osteopathic Medicine (NYCOM), which hopes municipal wireless networks will allow medical interns to communicate more closely with doctors and professors. "Kids growing up today expect free Web browsers, free messaging and free applications. It's only natural that they would come to expect free Internet service." MW

running on broadband

In new york, a candidate for governor takes a stand on universal access

by Joseph C. Panettieri

AP WIDEWORLD

FROM MONTAUK POINT TO THE BIG APPLE TO NIAGARA FALLS, New York State has grand ambitions for universal broadband access, at least if a couple of politicians get their way. Eliot Spitzer, the state's attorney general, has made universal broadband access one of the cornerstones of his 2006 gubernatorial candidacy. And Steve Levy, executive for Suffolk County, hopes to offer universal WiFi to Eastern Long Island's 1.5 million residents.

While the WiFi plans are still in their infancy, Spitzer and Levy are trying to stir interest in universal broadband. During a speech to college students in May, Spitzer asserted: "There is a growing digital divide on the world and, indeed, right here in New York. Our Internet speeds are slower and our prices are higher compared to most other industrialized nations of the world."

Spitzer noted that on a price-performance basis, U.S. broadband service is twice as expensive as in China, eight times more expensive than in South Korea, and 30 times more expensive than in Japan. "It is no wonder that the United States has plummeted from fourth in the world in broadband penetration to sixteenth in just the last four years." Spitzer proposes that New York launch a comprehensive statewide broadband initiative to ensure universal access to affordable, high-speed broadband service for every New Yorker. The system, he says, would empower students, enhance homeland security, and improve statewide healthcare.

For public broadband to succeed, Spitzer says local municipalities must be empowered to adopt broadband strategies necessary to make Internet access affordable and fast. He noted that Suffolk County, one of the state's largest counties, plans to provide affordable Internet access to all residents. Suffolk's WiFi plans are still in their infancy, but the county hopes to pull together a formal business plan in the next month, says Sharon Cates-Williams, the county's information technology commissioner.

While promising, New York's broadband ambitions face financial, political and cultural challenges. "The success of these efforts depends on the business model and what the state hopes to achieve," says Craig Plunkett, founder of CEDX Corp., a WiFi solutions provider in East Northport, N.Y. "If the goal is to blanket the state with WiFi, it's a pipe dream. As many cell towers as you have now, you'd need twice as many for universal WiFi. And in Suffolk County, WiFi is at the examination stage. They haven't sorted out their goals yet."

In the meantime, New York's entrenched providers such as Cablevision Systems Inc. continue to promote broadband—though not always effectively. For instance, Cablevision is adding WiFi service to Long Island Rail Road (LIRR) train stations. But the Metropolitan Transportation Authority—which oversees the LIRR—has no plans to offer onboard WiFi service. Plunkett and other WiFi solutions providers have lobbied the MTA to embrace WiFi. And for good reason. On a typical weekday, the LIRR serves 269,000 passengers on 718 trains—a massive captive audience for potential WiFi service, notes Plunkett. The MTA did not return calls seeking comment.

On a broader scale, it's unclear how much it would cost New York to deploy statewide broadband. However, Spitzer is worried about the cost of inaction. During his speech in May, he said: "Economists from the Brookings Institution estimate that widespread adoption of broadband in the United States could add $500 billion to the nation's economy and produce over one million jobs. They also estimate that the cost to our economy for not adopting such a policy would be $1 trillion over the next decade." MW

innovation.

want to improve services and cross the digital divide? check out these breakthrough ways municipalities are using wireless networks by Joseph C. Panettieri

Move over, Steve Jobs. Take a back seat, Bill Gates. It's time to let municipal technology managers drive innovation for a while. Indeed, across the United States, cities, towns, counties and other municipal entities are deploying innovative, next-generation wireless applications that strengthen public service, enhance public safety, improve revenue collection and eliminate the digital divide.

- In the City of Granbury, Texas, businesses are installing wireless digital video surveillance systems that allow police and fire departments to monitor building interiors from afar.
- In the City of Pleasant Hill, Calif., specially designed wireless customer relationship management (CRM) applications reach employees on the go.
- In Pamlico County, N.C., a non-profit organization called PINE Corp. is rolling out WiFi exclusively for charitable, educational and scientific purposes.
- In the City of Miami Beach, Fla., parking meters by next year will feature wireless automated meter reading (AMR) capabilities that replenish city coffers and keep motorists honest. And when Miami Beach activates a free WiFi network later this year, it will effectively eliminate the city's digital divide.

These are just a few of the ways in which municipalities are driving wireless innovation. In fact, many muni applications are more advanced than those found in the most progressive Fortune 500 companies.

"When it comes to wireless, businesses aren't necessarily driving innovation," notes Ed Golod, president of Revenue Accelerators Inc., a technology consulting firm in New York. "Instead we're seeing some dramatic developments in the municipal sector. Citizens are demanding wireless services, and municipalities are testing applications that improve the public well-being and unlock new revenue opportunities."

Take, for instance, the City of Riverside, Calif.

Riverside is one of the nation's first cities to roll out both 4.9-GHz and 802.11x WiFi service for the entire city, and is also testing an application for WiFi-enabled meter reading. The wireless utility-reading application will collect power usage data every 15 minutes from utility meters at 5,000 commercial sites, and then relay the information in real time to commercial customers. "Customers that take part in the network will be able to monitor their power usage and utilize lower-cost electricity [during non-peak hours] for manufacturing processes," says city CIO Steve Reneker.

At the same time, the Southern California town is deploying WiFi-enabled cameras at all street intersections to improve traffic management and reduce congestion during special events such as parades. "We're looking to expand video surveillance to over 300 cameras for our parks, facilities and in high-graffiti and illegal-dumping areas to better police our neighborhoods," notes Reneker.

Similar steps are under way in Addison, Texas, which deployed citywide WiFi service in August 2005. The system, provided by Red

Innovations: Five Cities Worth Watching

City of Granbury, Texas: Wireless Pictometry application allows the Fire Department to view near-3D images of buildings and other local structures. Now deploying digital surveillance video systems to monitor building internals and exteriors.

City of Fairfield, Calif.: Rolling out push software that delivers large files and photos to mobile data computers in patrol cars and fire vehicles. Eliminates manual updates that required 30 minutes per car.

City of Riverside, Calif.: Police cars will soon gain in-vehicle video, and all intersections will gain video cameras to manage traffic patterns during high congestion.

City of Miami Beach, Fla.: Piloting automated meter reading and WiFi access for all parking meters.

City of Industry, Calif.: Mobile employees access a specialized, hosted CRM (customer relationship management) application over wireless links.

Moon Broadband, a Plano, Texas, wireless Internet service provider (WISP), initially supported 15,000 residents but is now being upgraded with Video over IP capabilities to improve public safety. For instance, the city intends to use the video service to safeguard Addison Circle Park, which features more than 372,000 square feet of outdoor and indoor space, and 2,100 parking spaces for major local events.

"We can have thousands of people at any one time in the park," says Hamid Khaleghipour, information technology director for the City of Addison. "Video surveillance will help to ensure crowd safety. We are deploying at least 15 cameras over the next few months, and an RFP for the system will be issued in June."

Innovating: Video

Video applications, such as the one in Addison, are a major area of innovation for communities throughout the U.S. These deployments can be tricky, however, because most low-cost WiFi video cameras are designed for indoor use and can't withstand extreme outdoor climates. To deal with that, many municipalities are embracing rugged Pan/Tilt/Zoom (PTZ) cameras from Sony. The cameras, distributed by such firms as Inter-Pacific Inc., typically have a 200:1 zoom capability. When mounted atop a low-rise building, the cameras are powerful enough to read license plates and even vehicle registration tags.

One of the eager proponents of the Sony cameras is the San Mateo County, Calif., Sheriff's Office. During the Scott Peterson murder trial in 2004, the sheriff's office installed several Sony WiFi cameras around the local courthouse to ensure public safety. A Tropos Networks metro-scale WiFi system linked the cameras to PC-based digital video recording software from On-Net Surveillance Systems Inc. The entire system was deployed in three days for a capital equipment cost of around $30,000, according to Tropos. Tropos's WiFi network provided integrated security that safeguarded signals between the cameras and the central PC monitoring system.

Plenty of municipalities are following San Mateo County's lead. Granbury is deploying a digital surveillance video system so police and firefighters can see inside and around business perimeters even before they arrive to emergency calls. "It is especially helpful for police because they can see a perpetrator and get a description before even arriving and possibly see him fleeing and what type of automobile is involved," says Tony Tull, IT director for Granbury. City Hall and the City Service Center facility are already live on wireless video mesh.

Innovating: Voice

Much like video, voice applications are also moving onto muni WiFi networks. The City of Riverside, for one, hopes to win Homeland Security grants in the next few months that will fund wireless VoIP as a back-up emergency communication system. The primary platform will remain a Motorola radio system.

VoIP has come a long way from its inception as an over-hyped and under-delivered technol-

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ogy of the 1990s. Roughly 50 percent of large companies now have widely deployed VoIP systems, and 75 percent of those firms are "extremely satisfied" with their VoIP deployment, according to a survey by Gartner Inc., the Stamford, Conn.-based technology research firm.

Still, VoIP's momentum within corporate enterprises does not guarantee its successful deployment in muniwireless settings. Indeed, much of the world's current WiFi gear wasn't designed to run VoIP applications, especially in exterior public settings, says Joe Epstein, chief architect at Meru Wireless, a wireless LAN infrastructure firm founded in 2002.

The problem has to do with WiFi's heavy reliance on client-based information processing, which limits scalability. Meru, by contrast, has developed intelligent access points that move WiFi's intelligence off clients and onto the network. The intelligent approach to access points allows WiFi, and therefore wireless VoIP, to scale more efficiently, Epstein says.

Early adopters include the Bahamas, which will gain an island-wide WiFi deployment based on Meru's technology within the next few months, according to a recently announced contract involving Sawtel Inc., a wireless telecommunications provider.

Innovating: CRM

In addition to video and VoIP, traditional enterprise IT applications, such as CRM, are being deployed on muniwireless networks. But, where you might expect the major applications vendors, such as Oracle Corp., SAP AG and Salesforce.com, to be driving muni CRM, many municipalities are discovering that those "enterprise" solutions weren't necessarily designed with them in mind.

Just ask Mike Ramsey, city manager for the City of Pleasant Hill, Calif. "We looked at one or two traditional CRM systems but were turned off by their price and complexity," recalls Ramsey. Instead, Pleasant Hill embraced a hosted muni CRM solution from Comcate Inc.

Comcate was founded in 2002 by Ben Casnocha. He was 14 years old then, and is now a grizzled veteran entrepreneur of 18. Comcate focuses specifically on CRM for public agencies. More than 50 municipalities have signed up for Comcate's hosting services, and many of them are now testing the service over public WiFi links.

"We went with Comcate because of its simplicity of design," says Ramsey. "We can easily craft and modify automatic responses to our customers, and the reporting tools alert me if we need to respond to customers in a more timely manner."

Other early adopters include the City of Industry, Calif., according to Don Gray, who oversees code compliance for the municipality. As this story went to press, City of Industry was testing Comcate on wireless computers, thereby pushing city employees closer to customers.

Still, such deployments—if mismanaged—can tempt fate. "We've all read about lost laptops and poorly secured wireless networks that led to compromised customer data," notes Golod of Revenue Accelerators.

No Risk, No Reward

Indeed, innovation always invites risks and challenges, and municipal wireless is no exception. For instance, the video-over-wireless applications, such as those in Addison and San Mateo, demand hefty bandwidth and sometimes trigger privacy concerns. Similarly, consumer advocates worry that application data, when transmitted over wireless networks, leaves customer information open to probing eyes. On top of those challenges, of course, are the political risks inherent in any municipal activity, particularly those that involve spending public funds.

According to Panda Labs, approximately 60 percent of WiFi networks have no security in place, making public users potential targets for malware, spyware and other nefarious code. Plus, certain wireless security standards, such as WEP (Wired Equivalent Privacy), have scalability challenges. "The downfall of WEP in large environments is [security] key distribution," notes Brian Maroldo, technical director at the New York Institute of Technology, a college that deployed campuswide wireless networks in 2003. "Once you publish the keys to a wide audience, the level of protection

New Kid On The Block

He's only 18 years old, but Ben Casnocha has already revolutionized the way 50 municipalities manage customer information. As founder of Comcate Inc. in San Francisco, Casnocha has developed a customer relationship management (CRM) system that allows local governments to work more closely with their residents. While most customers access Comcate over traditional wired networks, several municipalities are now testing the CRM platform across wireless networks.

Casnocha's interest in the municipal sector began in sixth grade, when a volunteer project tasked him with building a community/government Web site. Though only 12 years old at the time, Casnocha examined how the retail sector rapidly resolved customer complaints. He then applied those lessons to government. "I wanted to build a service that would resolve customer complaints about local government rapidly and efficiently," says Casnocha.

The project prompted Casnocha to meet with city managers, IT directors and other city officials. He began to understand key government processes—and everyday government challenges—that mainstream software vendors had overlooked. "I decided it was possible to improve the lives of small agencies that get ignored by larger software providers," Casnocha says.

While major CRM companies, such as Siebel Systems, designed their products to help businesses maximize profits per customer, Casnocha designed Comcate's software to improve customer service and manage citizen inquiries. Government agencies have used Post-It notes, voice mail, generic e-mail inboxes and other antiquated or decentralized systems to manage citizen inquiries. Comcate's software tracks and routes messages to the proper agency so that pothole complaints can automatically reach the department of highway services for resolution, rather than sitting in a generic e-mail inbox for the mayor.

"Citizens don't know what CRM is, but they're demanding CRM capabilities," says Casnocha. "When people buy a book from Amazon, they receive an e-mail confirmation and the book arrives in two days. Those citizens now want the same level of service from their local government."

dwindles down to near non-existence."

Newer protocols, such as WPA (Wireless Application Protocol), solve this by negotiating keys at session initiation and continue to change them on a regular basis, perhaps even at every packet. "However, not all wireless cards support WPA and/or 802.1x/802.11i," laments Maroldo. "End users may find themselves unable to connect unless they purchase new hardware or make some configuration changes."

The challenge for municipalities looking to innovate is not to ignore the risks, but to confront them and mitigate them. "There will be fewer and fewer implementation hurdles as more and more municipalities roll out WiFi networks," says Golod. "Even among early adopters, who sometimes faced steep learning curves, the benefits of muniwireless networks were easily justified. That's why the pace of WiFi deployments continues to accelerate."

Just ask Trish Walker, chief financial officer for the City of Miami Beach, Fla. By the end of this year, Miami Beach expects to have a free, citywide WiFi network operational. The system will lay the foundation for police, fire and building code applications that enhance public safety. "Deploying these applications along with citywide WiFi will keep us pretty busy for the next few months," says Walker. "But the effort will surely pay short- and long-term dividends."

Welcome to the age of wireless innovation —driven by municipalities. MW

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here comes wimax.

how will it mesh with wifi? by Steve Stroh

Municipal wireless networks using WiFi technology have proven to be effective, popular and economical—even though the technology was originally intended purely for indoor wireless local-area networks (WLANs). In fact, WiFi networks have been so simple to install (relatively) and inexpensive to deploy (again, relatively), WiFi technology has emerged as the de facto standard for muniwireless installations in the United States.

Now, however, after years of hype, a new broadband wireless technology—WiMAX—has finally arrived. WiMAX is designed primarily for backhaul connections between communications networks and buildings. This year, the first officially certified WiMAX products are beginning to ship and, unlike WiFi, these WiMAX networks were designed from the ground up for deployments such as municipal wireless.

So, for municipalities, two big questions arise: (1) Is it likely WiMAX will soon displace WiFi as the technology of choice for muniwireless networks and; (2) Are municipalities that have already installed WiFi in danger of having their networks rendered obsolete and eclipsed by newer networks using WiMAX technology?

The short answers to both questions are simple: No and No.

In the view of many experts who are watching the startlingly fast evolution of muniwireless networks, the "WiFi versus WiMAX" question boils down to this simple reality: WiFi is already predominant, and WiFi-enabled user devices are ubiquitous, cheap and working well enough for most people's requirements. That is... the market penetration of WiFi devices is enormous and this pool of WiFi devices isn't going to get changed out anytime soon. As a result, in municipal wireless networks, it would seem that WiFi has "won" the market because it arrived much earlier than WiMAX and because vendors were able to adapt and expand the technology to the point where it can now successfully handle tasks for which it wasn't originally designed (see related story).

WiMAX as complement, rather than competition, to WiFi in municipal wireless networks offers an enormous value proposition.

However, WiMAX as complement, rather than competition, to WiFi in municipal wireless networks offers an enormous value proposition. The most obvious complementary role is for WiMAX to function in a backhaul

A Better WiFi . . .

Many pundits posit that WiFi should not work at all in municipal wireless networks, and they have some valid points. WiFi was originally intended solely for use in wireless local-area networks, primarily indoors, with some peripheral coverage outdoors in settings such as college campuses. However, vendors have successfully "extended" the various technologies that support WiFi to make it work reasonably well in municipal wireless networks.

One easy modification was to simply use more power. Most indoor WiFi access points use power levels as low as 30 milliwatts. In the U.S., it is legal to use up to 1 Watt of power, and most muniwireless networks operate at the highest power level that is legal. To compensate for low transmit power by the client WiFi device, municipal wireless access points were designed with far more sensitive receivers than the average indoor WiFi access point.

Another adaptation of WiFi for muniwireless networks was the relaxation of timing parameters. WiFi was originally intended to operate in very close proximity between nodes, so the expected "propagation time" was very short. When WiFi began being used in outdoor applications, where the "proximity" could extend to miles, WiFi's "timeout" mechanisms generated excessive (and bandwidth-consuming) automatic retries. With relaxed timings, outdoor WiFi now "just works."

A third adaptation of WiFi for muniwireless networks has been the use of directional antennas and "close-in" nodes, exemplified by mesh networking systems. This cuts down the distance between the client and network node, so data has a better chance of being received intact and without interference.

The reason that these and many more such innovations are occurring is that WiFi client devices are very cheap or free (built-in), creating a huge installed base. Thus, any significant innovation that helps to fix problems in WiFi finds very willing customers. —S.S.

role for mesh networks, with WiFi as a short-range access technology.

WiMAX networks offer a greater range, quality of service and higher speeds than WiFi. These advantages make it a perfect fit for the mesh backhaul role. The more bandwidth that can be injected into a mesh, the better the mesh will perform. Using WiMAX in a complementary backhaul role keeps latency down and enables the network to devote most of its channel capacity to user traffic.

This "WiFi as user access, backhaul with something else" approach is already being implemented in a number of municipal WiFi network systems. SkyPilot Networks, for example, uses the 5.8-GHz band to link between nodes, using proprietary technologies that are similar to WiMAX.

Here's another way in which WiMAX will likely complement WiFi: When WiMAX is deployed as a WiFi backhaul, the service provider can then offer access to the WiMAX network as an additional tier of service above and beyond what can be provided by a municipal WiFi network. Businesses demand good quality of service, reliability and high speeds, and often are more than willing to pay reasonably higher fees to receive a higher level of service quality.

In many countries, service providers are providing new competitive wireless broadband services based on WiMAX, rather than retrofitting WiFi networks.

WiMAX International

In markets outside the U.S., the situation is evolving very differently. One key difference, and it's huge, is that markets outside the U.S. have access to "new" spectrum, centered around 3.5 GHz, which is intended for wireless broadband services. Such spectrum is entirely licensed, not license-exempt.

In many countries, service providers are providing new competitive wireless broadband services based on WiMAX, rather than

. . . And A Better WiMAX

WiMAX is not actually new technology per se: It merely integrates some of the best capabilities of proprietary broadband wireless systems that have been around for a number of years. In many ways, WiMAX—in particular the IEEE 802.16 standard upon which it is based—was coaxed into existence by demands from telecommunications carriers.

Basically, the carriers felt WiFi lacked Quality of Service (QOS) capabilities. QOS is a key requirement since WiMAX won't only be used for data, but also for voice services, where QOS can dramatically improve the voice quality. Another reason is that with licensed spectrum, the interference issues inherent in license-exempt spectrum can be eliminated.

Improvements over WiFi by WiMAX (for use in muniwireless networks) include:

- **Flexible spectrum options.** WiMAX can use different channel sizes, from 3.5 MHz to 10 MHz. Generally, the wider the channel, the faster the data throughput, but when scarce spectrum needs to be aggressively shared, narrow channel sizes allow more concurrent usage of spectrum.
- **WiMAX can also use Time Division Duplexing (TDD)** to both transmit and receive in the same portion of spectrum, or Frequency Division Duplexing (FDD) to allow transmitting and receiving to have dedicated portions of spectrum.
- **Quality of Service mechanisms.** WiMAX has a number of QOS options ranging from highly deterministic (great for Voice over Internet Protocol) to "best effort" (the packets will arrive, eventually).
- **Improved security.** Theft of service is a very real issue in large networks, and WiMAX security was designed with such security issues in mind.
- **Licensed/license-exempt spectrum options.** WiMAX was designed for use in licensed spectrum such as the 3.5-GHz band used to provide broadband services outside the U.S., but will also operate in the license-exempt 5.8-GHz band.—S.S.

What's In A Name?

WiMAX ostensibly stands for Worldwide Interoperability for Microwave Access. In reality, that explanation for what looked like an acronym was created solely for the "comfort" of editors. WiMAX is a created name, somewhat riding on the enormous success of the WiFi trademark but implying "better than WiFi". Within the industry, WiMAX is a "standalone" word. Very technically, WiMAX is simply a trademark of the WiMAX Forum, and to the industry, it's simply "WiMAX."

retrofitting WiFi networks. In doing so, they will deploy a mixture of fixed WiMAX and mobile WiMAX. Fixed WiMAX offers longer ranges and faster speeds than mobile WiMAX, but, unlike mobile WiMAX, it requires an external antenna and does not offer mobility.

In WiMAX, the 3.5-GHz band is the hotbed of innovation, and the vast majority of attention, product development and systems deployment is being directed at untapped markets for broadband in countries such as China and India. As one analyst put it at a recent conference: "In those markets, WiMAX isn't a competitive offering or supplement to existing broadband service. In those markets WiMAX will become the first and only broadband service that's available at all."

WiMAX USA

In the U.S., one major advantage of WiFi over WiMAX is that WiFi operates primarily in the 2.4-GHz band. Current technology makes it possible to implement terrestrial mobile services up to 3.5 GHz, but no higher. No one is positing Mobile WiMAX in the 5.8-GHz band, so if mobility is critical, then using WiFi seems to be the best option.

WiMAX will be mostly limited to using the license-exempt 5.8-GHz band for fixed WiMAX services in the United States. WiMAX is being designed to use three primary portions of spectrum—3.5 GHz (licensed, fixed and mobile); 2.3/2.5 GHz (licensed, fixed and mobile) and 5.8 GHz (license-exempt, fixed only).

The 3.5-GHz band is not available in the United States because it has already been put to use by the U.S. Department of Defense for various military uses. While 2.3/2.5 GHz seems to be firmly on the WiMAX road map, the essential work of creating WiMAX "profiles" for 2.3/2.5 GHz has not yet been completed.

In the U.S., the licensed 2.3-GHz band is interleaved with the Digital Audio Radio Service (DARS). The satellite radio providers, XM and Sirius, use powerful terrestrial transmitters to supplement satellite coverage, and that has caused some significant interference issues to communications users of the 2.3-GHz Wireless Communications Service (WCS) band.

In the U.S., the 2.5-GHz band is licensed to a number of entities. Sprint/Nextel has obtained rights to most of the 2.5-GHz band in municipal areas, but has no immediate plans to deploy systems at 2.5 GHz. Clearwire owns another significant portion of the 2.5-GHz band, but is mostly deploying their systems in rural areas and non-major cities.

Conclusion

In summary, it appears that WiMAX versus WiFi in municipal wireless networks is not an either/or question, but rather a series of questions about which technology provides a best fit for the various roles. While WiMAX doesn't (yet) seem destined to displace the use of WiFi, it will certainly have a key role to play in new municipal wireless networks.

If you're looking for a definitive technological reference for WiMAX, we strongly recommend this book: *WiMAX Handbook; Building 802.16 Wireless Networks* by Frank Ohrtman, copyright 2005, published by McGraw-Hill Companies, ISBN 0-07-145401-2. MW

STEVE STROH IS SENIOR RESEARCH ANALYST FOR CONXX, INC. HE HAS BEEN WRITING ABOUT BROADBAND WIRELESS INTERNET ACCESS SINCE 1997. MORE INFORMATION IS AVAILABLE AT WWW.STEVESTROH.COM

Don't Make a Mess of Your Mesh

Municipal wireless mesh networks are blossoming all around the U.S.
If you are an engineer or technician responsible for designing, installing or operating a network, it's time to get serious expert training to stay competitive, enhance your skills and make sure your network doesn't end up in the obituary pages of the local newspaper.

MuniWireless, the leading information provider in municipal broadband, is partnering with DoceoTech Inc., the leader in expert training for wireless technologies, to provide the industry's first and most comprehensive technical training for municipal mesh networks. Training courses will be offered in a variety of formats, including one-day seminars and three-day boot camps that teach all design steps an engineer would consider for mesh deployment.

Courses will be available at cities all across the U.S., starting this fall.
For details come to www.doceotech.com or www.muniwireless.com or call 877-438-6401.
Or visit us at MuniWireless Silicon Valley, June 19-21 at the Marriott Santa Clara.

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corpus christi

tales from the front lines by Mike Perkowski

When it comes to municipal wireless, Corpus Christi, Texas, is nothing if not ambitious. Consider that in a 30-month period ending this September, Corpus Christi will have: • Unwired all 147 square miles of its land-mass boundaries • Deployed applications for public utilities, public safety, building inspection and digital inclusion • Laid the groundwork for citywide Voice-over-WiFi capability • Set in motion plans to sell wholesale Internet access to Internet service providers (ISPs) and telephone companies at affordable prices • Allocated more than $7 million to build the citywide WiFi cloud • Committed another $26 million for its flagship automated meter reading (AMR) application over five years.

While cities such as Philadelphia and San Francisco have attracted national attention, Corpus Christi, a deepwater port of more than 277,000 residents, is the real poster child for public wireless broadband, fueled by a pioneering zeal for big ideas that promise to change the way cities conduct business.

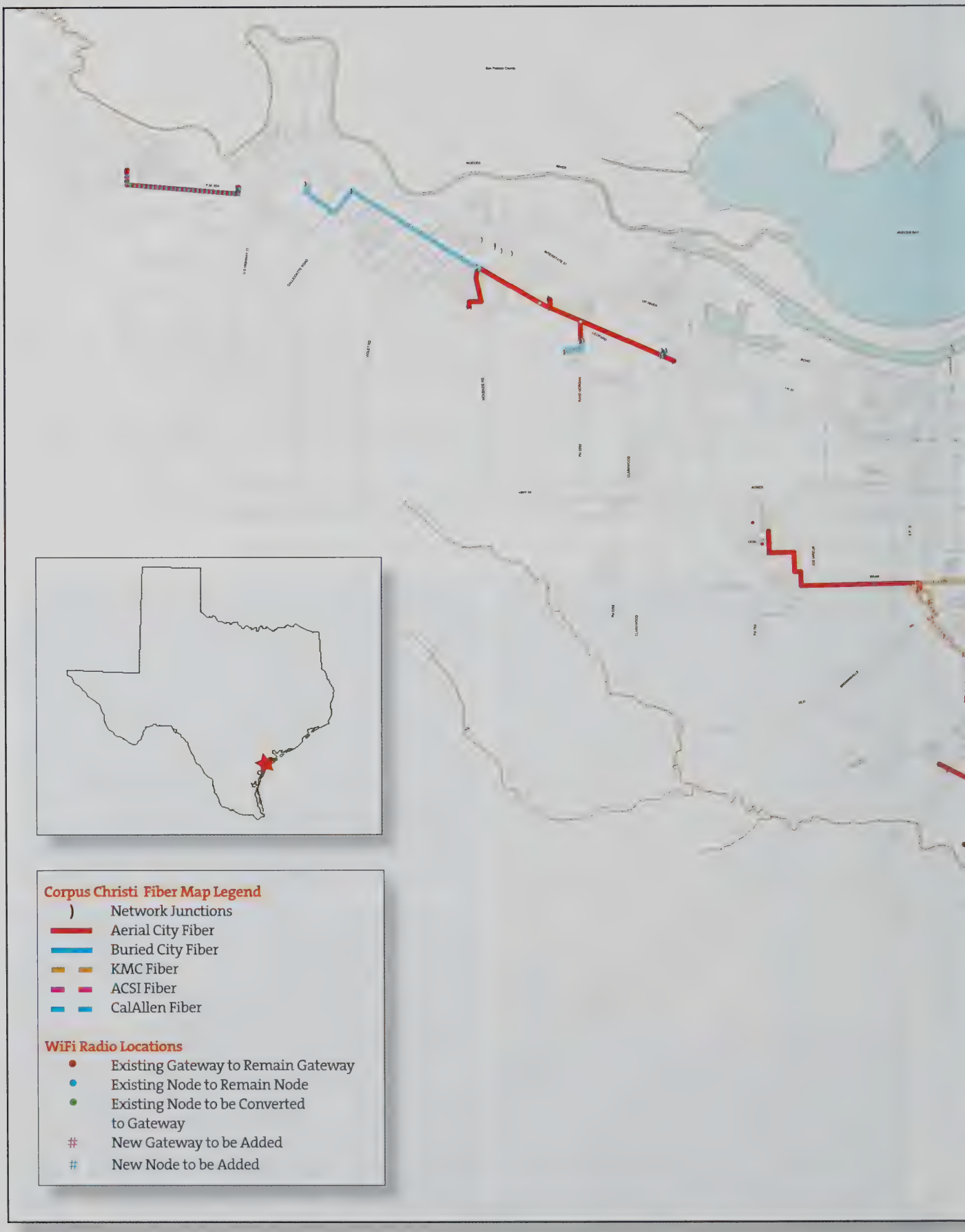
"Corpus Christi has been pervasive in what they're doing with wireless throughout the city," says Jeffrey King, director of sales and marketing for Northrop Grumman IT Utility Systems, the prime contractor for Corpus Christi's deployments. "They are looking at this as a transformational technology. When the entire city goes wireless, it will allow them to look at the business of government in an entirely different light."

Leonard Scott, business unit MIS manager and project leader for the WiFi program, says city leaders grasped the stunning potential of the technology several years ago, green-lighting the IT group's recommendations for AMR and, eventually, other applications. "Our city manager, Skip Noe, is very technically astute, and the City Council has encouraged us to move ahead," says Scott. "Their attitude has been 'Do it, handle it. How come it's not done yet?'" And what, exactly, have the political powers supported so far? A raft of WiFi-enabled applications, including:

>> **Automated meter reading.** The city's aging water and gas meters were under-reading consumption by as much as 40 to 50 percent, meaning they'd have to be replaced or retrofitted in order for the city to accurately bill business and residential users. In addition, the manpower required to visually inspect the city's 85,000 water meters—often located in hard-to-access areas—made the process prohibitively expensive.

The city's wireless AMR application—even in just the first year of deployment—has delivered more accurate reading. And it's a lot safer than the pre-WiFi method, where workers would occasionally encounter such obstacles as high

Text continues on page 34, turn page for network map


Corpus Christi Fiber Map Legend
Network Junctions
Aerial City Fiber
Buried City Fiber
KMC Fiber
ACSI Fiber
CalAllen Fiber
WiFi Radio Locations
Existing Gateway to Remain Gateway
Existing Node to Remain Node
Existing Node to be Converted to Gateway
New Gateway to be Added
New Node to be Added

walls and poisonous snakes. In fact, a city meter-reader was attacked and bitten by a dog several years ago while reading a backyard meter, resulting in serious injury to the employee and a lawsuit to the city. To date, more than 17,000 gas and water meters have been deployed as part of the AMR application. While Scott says the city is being conservative in projecting the return on investment for the AMR project, he estimates the project could break even in its seventh year of operation. It has already begun operating "in the black in year three, in terms of cash flow."

>> **Building inspections.** After AMR, WiFi-enabled building inspection was a logical next step, Scott says. Traditionally, building inspection took up nearly 25 percent of the time required to get a facility built. "With our network, this process has been dramatically streamlined," Scott says. "We generally can do same-day inspection and approval, avoiding back-and-forth on paperwork and similar repetitive tasks. It's cut about 23 percent out of the time required to construct and open a building in Corpus Christi, which translates into big savings for buildings and, ultimately, for the builders' customers." Adds King of Northrop Grumman: "For builders, time is literally money; they have to get it built and occupied in order to recoup their investment more quickly. If you're a builder, Corpus Christi is a more attractive place to do business due to this capability."

>> **Public safety.** At present, all first-responder vehicles are WiFi-enabled. A proof-of-concept for an innovative police video-surveillance solution is nearly done. Additionally, medical information software is being developed for WiFi-enabled ambulances and hospital emergency rooms. The goal is to equip all first responders with wireless access to centralized databases and enable them to transmit data in real time. "When fire department medics go on their runs each day, they are responding to calls that generate a flood of information," says King. "By the end of the day, the EMS personnel literally have to reconstruct everything they did that day on each call—blood pressure, heart rate, treatment, times, names, places and so on. Now, they will record and transmit this data electronically through the WiFi network, saving on overtime and reducing recording errors. And, if they're transporting patients to the hospital, the ambulance is transmitting data to the emergency room before they pull in."

>> **Digital inclusion.** Corpus Christi's school district is installing wireless infrastructure. The city is also teaming with Dell Inc. to provide WiFi-enabled notebook computers for underserved schools, and one of Corpus Christi's two middle schools will act as a pilot both for in-school learning and to help students—and their parents—stay in touch with teachers from home.

>> **Voice over WiFi.** "We're working very heavily on VoIP (Voice over IP) right now, primarily for internal operations," Scott says. With the city spending about $500,000 annually for cellular service, voice is an area ripe for potential savings. Scott says the city is working closely with Sprint, Cingular and Lucent as part of the Voice-over-WiFi implementation.

Corpus Christi, Texas: City Snapshot

Population: 277,454 (2000 Census)

U.S. population rank: 59th

Square mileage: 504 square miles (150 square miles of land, remainder is water)

Form of government: Home rule, with Mayor, City Council and City Manager

Year of incorporation: 1924

Noteworthy people who grew up here: Actors Eva Longoria, Dabney Coleman, Farrah Fawcett and Lou Diamond Phillips; the late Hector P. Garcia, founder of the National G.I. Forum

Unusual fact: Corpus Christi has the 7th largest deepwater port in the nation

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1. What is the primary activity of your organization? (select one only)

- ☐ 01 Municipal Government (Town, City, County, or other local or regional)
- ☐ 02 State Government
- ☐ 03 Federal Government
- ☐ 04 Telecommunications Service Provider
- ☐ 05 Internet Service Provider
- ☐ 06 Wireless Internet Service Provider
- ☐ 07 Value-Added Reseller/Systems Integrator
- ☐ 08 Hardware/Software Manufacturer
- ☐ 09 Consultant
- ☐ 10 Education
- ☐ 11 Media
- ☐ 12 Investment/Financial
- ☐ 13 Lobbyist
- ☐ 14 Community Advocate
- ☐ 15 Other (please specify)_____
- ☐ 16 None of the above

2. What is your primary job function? (select one only)

Information Technology

- ☐ 17 CIO, CTO, CSO
- ☐ 18 VP/EVP/Director of IS
- ☐ 19 Network Manager, Telecommunications Manager
- ☐ 21 Engineering Manager
- ☐ 22 Other Information Technology Management
- ☐ 23 Information Technology Staff

Government

- ☐ 24 Elected Official (Mayor, Council Member, e.g.)
- ☐ 25 Non-Elected Official (Police/Fire Chief, Building Inspector, e.g.)
- ☐ 26 State/Local Regulator
- ☐ 27 Federal Regulator

Business

- ☐ 28 Chairman, CEO, President, Owner, Principal Partner
- ☐ 29 Controller, Treasurer, CFO
- ☐ 30 Vice President, General Manager
- ☐ 31 Technical, Engineering
- ☐ 32 Marketing, Sales
- ☐ 33 Other Business

Influencers

- ☐ 34 Consultant
- ☐ 35 Analyst/Financial Investor
- ☐ 36 Journalist

☐ 37 **Other** (please specify)_____

3. If you are with a municipality, what is the status of your municipality's broadband wireless network? (select one only)

- ☐ 38 Already up and running
- ☐ 39 Plan to install within the next year
- ☐ 40 Plan to install within two years
- ☐ 41 Plan to install with no time frame
- ☐ 42 Thinking about it, but no specific plan to install
- ☐ 43 Other (please specify)_____

4. What is the approximate population of the community the network serves/will serve? (select one only)

- ☐ 44 More than 1 million people
- ☐ 45 500,000 to 1 million
- ☐ 46 250,000 to 499,999
- ☐ 47 100,000 to 249,999
- ☐ 48 50,000 to 99,999
- ☐ 49 25,000 to 49,999
- ☐ 50 10,000 to 24,999
- ☐ 51 Less than 10,000

5. What technologies/platforms/services are you using and/or considering for your municipal broadband network implementation? (select all that apply)

	Using	Considering
52 Mesh Networks	A ☐	B ☐
53 WiMax	A ☐	B ☐
54 Security Products	A ☐	B ☐
55 Customer Premises Equipment	A ☐	B ☐
56 Back Office Equipment	A ☐	B ☐
57 Consulting Services	A ☐	B ☐

58 Other (please specify)_____

6. What applications are you using and/or considering for your municipal broadband network? (select all that apply)

- ☐ 59 Public Safety
- ☐ 60 Education/Training
- ☐ 61 Asset Tracking/SCADA (Supervisory Control + Data Acquisition)
- ☐ 62 Building Inspection
- ☐ 63 Utilities/Public Works
- ☐ 64 Hospitality/Visitor Services
- ☐ 65 Residential Public Access
- ☐ 66 Business Public Access
- ☐ 67 Homeland Security
- ☐ 68 Disaster Recovery
- ☐ 69 Other (please specify)_____

7. Approximately how much is your municipality planning on spending for municipal wireless networks in the next 12 months? (select one only)

- ☐ 70 less than $10,000
- ☐ 71 $10,000 to $24,999
- ☐ 72 $25,000 to $99,999
- ☐ 73 $100,000 to $499,999
- ☐ 74 $500,000 to $999,999
- ☐ 75 $1 million to $2,499,999
- ☐ 76 $2.5 million to $4,999,999
- ☐ 77 $5 million or more
- ☐ 78 None of the above

8. What is the scope of your purchase authority for your installed or planned municipal broadband networks? (select all that apply)

- ☐ 79 Approve purchases
- ☐ 80 Approve vendors
- ☐ 81 Evaluate vendors
- ☐ 82 Prepare/write RFPs
- ☐ 83 Recommend requirements
- ☐ 84 Recommend vendors
- ☐ 85 None of the above

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An additional potential application would be as a backup to the wireless data network in the event of an emergency outage.

>> Internet access resale. "Once the network is fully deployed, we'll use 40 percent of the capacity for government operations; that alone will allow the network to pay for itself within four years," says Scott. But what about the extra network capacity? "We'll make the remainder available to ISPs for resale; it's a no-brainer to wholesale it," adds Scott, noting that the city will work closely with local service providers to find ways to make Internet access affordable to residents and businesses.

How did Corpus Christi come this far, this fast? City officials admit they didn't intend to deploy each of these applications so quickly when they first went to a trade show late in 2003 and watched Tropos Networks demonstrate its mesh radios. But the successful pilot of the Tropos mesh infrastructure got them thinking: What else, other than meter reading, could they do differently with a citywide WiFi cloud? The answer: A lot.

Before moving forward, the city needed a strategic plan, says city CIO Ogilvie Gericke. "You have to prioritize from the beginning," Gericke says. "Otherwise, you will be spending time and money unwisely. You can't just make random decisions based on what's possible or who's interested in supporting the initiative."

Gericke says city officials were helped by Northrop Grumman, which conducted a department-by-department audit of government operations and business processes to see where immediate efficiencies could be realized from the wireless network. "Actually, having the AMR application roll out first, and successfully, was very important in letting other departments see what was possible. It became a test-bed for others to study and learn from," Gericke says.

Now, wireless infrastructure is ingrained in the city's strategic planning. "The City Council sees this as infrastructure in much the same way they see sewers and streets, and it should be funded that way," says Scott, noting that the network build-out and expansion will be funded in the city's capital expenditures budget. "It's kind of like the way cities built roads 150 years ago; As a few cities started to use public monies to build the roadways, it gained momentum and became an accepted practice among cities."

Corpus Christi's efforts have caught the attention of other communities, as well as technology providers, including Intel Corp., which designated the city as its first "Digital Community," a distinction bestowed upon cities that demonstrate forward-looking use of wireless networking for the community's benefit. "Corpus Christi, to date, is probably the pre-eminent digital community," says Paul Butcher, Intel's marketing manager for state and local government. "They are focused on the solution, rather than on the connectivity. They know it's not about the pipe, but about having a sound portfolio of solutions." **MW**

Corpus Christi, Texas: Network Snapshot

Geographic coverage: 80 square miles at present; to be expanded to full citywide coverage by August 2006

Throughput: 1 Mbps minimum

Primary applications: Meter reading; building inspection and public safety; Voice over WiFi to be added next

Deployment timeframe: AMR application deployed in 2004; first phase of citywide network to be operational in August 2006

Spending: $7.1 million committed to date; anticipated 5-year spending of $26 million

Funding model: Municipal capital expenditures budget

Technology vendors: Tropos Networks (mesh infrastructure); Alvarion (point-to-point and point-to-multipoint solutions); Pronto Networks (OSS); Hexagram (AMR applications software)

Prime contractor: Northrop Grumman (consulting, systems integration, applications development)

BARBARA DAVIDSON

health and wifi.

Why the experts believe that WiFi is *not* hazardous to our health by Cyrus Farivar

Is WiFi hazardous to your health, or the health of the people in your community? While some questions have been raised in scientific circles about the health effects of radiofrequency radiation on humans, there is general agreement among professional and government entities worldwide that radiofrequency radiation at 2.4 GHz—the frequency of WiFi—is not damaging to humans. Still, a small handful of citizens and scientists remain skeptical.

"The reason for not going completely wireless is the 'precautionary principle,'" says Fred Gilbert, president of Lakehead University in Thunder Bay, Ontario, Canada. "Until such time as we have definitive findings that the wireless EMFs (electromagnetic fields) do not pose a health hazard, we will continue the policy."

Years of research and scientific findings, however, seem to make Gilbert's extreme caution unwarranted. Still, he is not alone in at least asking the questions. In fact, there have always been concerns about how radiofrequency signals affect human biology, ranging from early radio transmissions in the late 19th century to radar technology to the more recent cell phone and WiFi technology.

Radiofrequency radiation (RFR) is the propagation of electromagnetic energy through space. It has two basic properties: frequency and intensity. However, to measure biological effects, scientists are interested in how much energy is absorbed in human tissue. The unit for this measurement is called the specific absorption rate (SAR) and is expressed in watts per kilogram (W/kg).

The biological effects of WiFi are often connected to studies that have been done on cell phone technology. Cell phones and WiFi operate on different frequencies and have different levels of power intensity, but the standard for SAR is the same. While there has been some research conducted on the biological effects of WiFi on humans, there has been more research done on cell phones.

A 2005 study by a group of Swiss scientists, based at the Foundation for Research on Information Technologies in Society in Zürich, Switzerland, showed that by operating at the suggested distance of 20 cm, WiFi equipment (routers and cards) is well below the U.S. standards for W/kg.

Dr. John Moulder, a professor of radiation oncology at the Medical College of Wisconsin, who has researched and reviewed the biological effects of RFR, says that for WiFi, the standard for uncontrolled exposure of 0.08 W/kg would apply. He remains convinced that there is no health risk.

"I've heard the arguments but I haven't heard any science backing up why you would expect them to be," Moulder says. "If you believe that mobile phones are dangerous despite the science, then I think you'd believe that so is WiFi. But in terms of the science, have I seen any scientific studies that there have been problems with WiFi? No."

Moulder and others also point out that WiFi equipment emits less intense radiation than

VEER

countered by the general public are far below levels necessary to produce significant heating and increased body temperature," stated a 1999 FCC paper entitled "Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields."

Dr. Linda Erdreich, who has studied the biological effects of RFR for many years, and is now a senior managing scientist at Exponent, a scientific consulting firm, agrees with this assessment. "We know that there is an adverse effect [associated with RFR] and it starts with heating tissue, but all of these things are well below the standard," she says.

Outside the United States, similar conclu-

« While the 2.4-GHz WiFi frequency is the same frequency that is used by microwave ovens, a microwave oven has much more intense emissions than does a cell phone or a WiFi router or card. »

cell phones. Whereas most cell phones have a peak power output of 2 W, most WiFi routers have a peak power output of less than 100 mW. Additionally, unlike cell phones and their base stations, WiFi cards and routers are not in constant communication with one another.

Dr. Kenneth Foster, a professor of bioengineering at the University of Pennsylvania, recently completed a study of WiFi, taking over 350 measurements at 55 sites across four countries. According to his research, which was recently submitted to a journal for peer review, not only does WiFi equipment emit less radiation, it does so in much smaller bursts.

"The duty cycle of transmission of the access point and client cards (fraction of time that the transmitters were active) was small (a few percent or less) in all measurements," Foster says by e-mail. "When the networks were not being used, the duty cycle was 0.01 percent or so. That means that it is radiating power for 0.01 percent of the time."

While the 2.4-GHz WiFi frequency is the same frequency that is used by microwave ovens, a microwave oven has much more intense emissions than does a cell phone or a WiFi router or card. "Studies have shown that environmental levels of [radiofrequency] energy routinely encountered by the general public are far below levels necessary to produce significant heating and increased body temperature," stated a 1999 FCC paper entitled "Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields."

Dr. Linda Erdreich, who has studied the biological effects of RFR for many years, and is now a senior managing scientist at Exponent, a scientific consulting firm, agrees with this assessment. "We know that there is an adverse effect [associated with RFR] and it starts with heating tissue, but all of these things are well below the standard," she says.

Outside the United States, similar conclusions have been made by related entities in Canada, Europe and Australia. The Australian Radiation Protection and Nuclear Safety Agency and the Canadian Spectrum Management and Telecommunications use the same United States SAR value of 0.08 W/kg in an uncontrolled environment.

Despite this internationally compiled body of work about the health effects of WiFi, there remain a few concerned citizens who are not convinced. One of the main groups is the EMR Network, based in Vermont and Massachusetts. Among other arguments, the EMR Network cites non-thermal effects of RFR on biological tissue as a cause for concern. One of the main sources for this theory is the research done by Dr. Henry Lai, a professor of bioengineering at the University of Washington. He also is listed as an advisor to the EMR Network.

In 2005, Dr. Lai published a paper entitled "Biological Effects of Radiofrequency Electromagnetic Field" in the journal *Encyclopedia of Biomaterials and Biomedical Engineering*. In it he cites multiple examples of biological effects even at low intensity. However, he also admits that this does not necessarily mean that an adverse effect is taking place.

"We do not know if these effects occur in hu-

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Wireless Warrior

You've probably never heard of Esme Vos. But here's why your city officials may have.

By Jesse Drucker

Across the U.S., there's a battle raging over wireless Internet access. Telephone and cable companies are protesting efforts by local governments to set up citywide wireless networks, arguing the cities are competing unfairly against the companies' own high-speed networks. The struggle has played out in state legislatures across the nation, and now has even found its way to Congress.

So how did a lawyer living a continent away in Amsterdam become a key player in the fight?In 2003, Esme Vos, an intellectual-property attorney based in the Netherlands, became intrigued by the nascent U.S. municipal wireless movement. So she created MuniWireless.com as a clearinghouse for information on the cities' efforts.

Now the site—part bulletin board, part blog, part research database and part pulpit for tech evangelism—has become a crucial destination for city technology officials, journalists, bloggers and tech-heads looking for the latest developments on this fast-growing front.

Companies can find "requests for proposals" from cities seeking to set up wireless networks; cities can read about the problems other municipalities have faced with their wireless plans.

"She's like the dramaturge of the muni wireless movement," says Glenn Fleishman, editor of WiFiNetNews.com, a popular blog about wireless broadband. "As the debates are playing out, she's providing the information. I can't imagine a city or town doing research on this not turning to her site." He adds: "Essentially, she's been writing the briefs for these plans."

Indeed, Ms. Vos is an unabashed advocate of the municipal wireless efforts, arguing that the city-sponsored networks give consumers freedom of choice. "People now have choice other than the typical duopoly" of cable and telephone-company offerings, she says. "You'll start to seethe European model happen here of lower prices and more bandwidth."

She equates high-speed Internet connectivity with other basic infrastructure. "Many municipalities think this is like electricity and water," Ms. Vos says. "You can't live in the world today and be productive and do research without broadband."

The 44-year-old Ms. Vos took an unusual path to high-tech advocacy. A native of the Philippines, she moved to the U.S. with her family after graduating from high school. She earned bachelor's and master's degrees in chemistry at the University of California—Santa Cruz and Los Angeles, respectively—and went on to Harvard Law School. After six years as a securities and intellectual-property lawyer for the likes of Microsoft Corp. and Novell Inc., she moved to Amsterdam in 1994 and worked for European tech companies.

Ms. Vos's interest in municipal wireless plans was sparked in 2003. She had recently worked for a company that maintained a directory of Wi-Fi hot spots—places where people can connect to the Internet wirelessly. When talking to a friend about how cities were creating hot zones across the U.S. and elsewhere, she realized that nobody was tracking the trend. Ms. Vos set out to do the job herself. The U.S., in her view, was far behind Europe in terms of broadband access; the idea of watching the nation catch up fascinated her.

So she set up MuniWireless.com and filled it with information mostly gleaned from Google searches. In February 2004, she started the MuniWireless email newsletter—sending it out to municipal officials, tech vendors, journalists and others—and a few months later she started selling the first advertising for the site. (At the time, she largely earned a living from a Web site she operated with her husband that located and rated bed-and-breakfasts. Now she draws part of her income from MuniWireless's ad sales.)

While still relatively small, the site's unique-visitor numbers have roughly doubled in the past year, to between 400 and 500 per day. And many of those visitors are key players in municipal wireless networks. Ms. Vos says she receives several queries a week from municipal information-technology managers about the state of other networks, and even more questions from journalists.

"I usually visit it once or twice a week," says Tony Tull, municipal information-technology director for Granbury, Texas, which recently deployed a citywide wireless network to serve its population of 6,400. "It keeps me abreast of other roadblocks that other people are seeing [from] the telco/cable company side, and it lets me see different models for how cities may be structuring their deals. Her site has really done a lot for the movement."

The movement began in small towns like Granbury and Scottsburg, Ind., that were tired of waiting for telecom providers to offer high-speed Internet service. Now more than 100 municipalities have deployed some form of wireless network to give their citizens low-cost or free access to the Internet. The movement includes some of the country's biggest cities, among them Philadelphia, San Francisco, Minneapolis and Chicago, which are seizing on the idea as a way to bridge the digital divide and spur economic development.

In many cases, the cities are contracting with telecom start-ups or Internet-service providers to run networks using Wi-Fi or other high-speed wireless technologies. That's bad news for traditional telephone and cable companies, since the municipal networks' wireless antennas bypass the "last mile"—the wired connections, controlled by cable and telecom firms, that run into people's homes and offices.

To protect their turf, telephone and cable companies are lobbying local legislatures and now Congress to restrict cities' wireless plans. In 2004, Pennsylvania enacted a law that requires cities to seek permission from local phone companies before offering paid telecom services; a much-publicized plan by Philadelphia for a citywide wireless network was grandfathered under the law. Last year, legislatures in at least 14 states and Congress proposed legislation to restrict municipal wireless efforts. And the governors of Colorado and Nebraska signed into law bills that restrict government telecom initiatives.

The project in Granbury was nearly killed last year when SBC Communications Inc.—since renamed AT&T Inc.—lobbied against projects like it in the Texas legislature. A proposed bill to quash such projects expired without a vote in June. Ms. Vos's site tracked the developments in the legislative battle.

Traditional telecom providers argue that cities shouldn't be in the business of providing or offering telecom services. It's unfair, they say, since cities can tap tax dollars to compete with private industry.

Ms. Vos dismisses that argument. "What they ignore is the telcos are getting subsidies" in the form of tax breaks and federal and state assistance for rural telephone service, she says. "Second, why shouldn't a city subsidize something? Roads are subsidized. A lot of infrastructure is subsidized."

Ms. Vos is sympathetic to the reality that many telecom providers haven't yet upgraded their infrastructure in places where they are less likely to turn a profit. "If I'm in the business of making money, why would I serve a poor neighborhood?" she says. "But don't stop somebody else from doing that."

Still, Ms. Vos's advocacy of municipal networks puts her on the same side as a different set of powerful industry players: equipment and chip companies like Intel Corp., Dell Inc. and Texas Instruments Inc., which gain from the sale of chips, wireless-enabled laptops and other products that use fast Internet networks.

ROSALIE SOLLAVELD

PLUGGED IN *Esme Vos, creator of the influential site MuniWireless.com*

Not surprisingly, Intel and Tropos Networks, a Wi-Fi equipment vendor based in Sunnyvale, Calif., have each contributed $35,000 to the site, Ms. Vos says. And Internet-service provider* EarthLink* Inc., which is increasingly relying on the wireless sector for growth, sponsored the opening night of a conference Ms. Vos organized recently in San Francisco. In attendance: about 320 people, largely officials from city governments and tech companies.

The site "plays a real valuable role in our industry," says Don Berryman, president of municipal networks for EarthLink, which is going to offer wireless broadband service in conjunction with local governments in Anaheim, Calif., and Philadelphia, and is bidding on city projects in San Francisco, Minneapolis, Milwaukee, Portland, Ore., and Denver. "This industry has evolved quicker than almost any industry I've seen, probably because of players like this."

Recently, Ms. Vos has joined with a start-up media company based in Garden City Park, N.Y., called Microcast Communications Inc. to set up MuniWireless LLC. As part of the venture, she wants to launch a quarterly magazine about wireless networks and organize more conferences. She also has started a business doing original research, quantifying the size of the municipal wireless market.

In the future, she sees wireless networks nearly everywhere, not just for Web access but for voice services as well. "It will shrink the traditional business model dramatically," she says. Traditional telecom companies, she argues, will be forced to form partnerships with Internet companies to offer next-generation services. "They'll have to change," she says.

ORIGINALLY PRINTED IN THE WALL STREET JOURNAL, FEB 13, 2006, PAGE R8

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was not going to get him or his clients anywhere. "It was pretty clear to me that the [Federal Communications Commission] had preempted the field and had set the rules for what they believed to be safe levels of radiation from wireless equipment," he said. "What that meant for me was that so long as the people I was suing complied with the federal guidelines—regardless of whether or not I agreed—it basically made them bulletproof from my lawsuit."

Also in 2003, the EMR Network submitted a petition against the FCC—which was subsequently denied—to revise the regulations concerning human exposure to RFR. It was later denied again on appeal in 2004 in the D.C. Circuit Court of Appeals.

Despite the assurances from international and national bodies such as the World Health Organization for safety of WiFi and other equipment that emits RF radiation, there remain calls for further research.

« Dr. Henry Lai cites multiple examples of biological effects even at low intensity. However, he also admits that this does not necessarily mean that an adverse effect is taking place. »

mans exposed to RFR, or whether the reported effects are health hazards," Dr. Lai wrote in his 2005 article. "Biological effects do not automatically mean adverse health effects. Many biological effects are reversible. However, it is very clear that low-intensity RFR is not biologically inert. Much more needs to be learned, however, before a presumption of safety can be made."

One example of the EMR Network's influence is a 2003 court case in a Chicago suburb where a group of parents sued the local school district, alleging "serious health risks" involving WiFi networks in local schools. "Responsible scientists have reported that prolonged exposure to low-intensity RF radiation can break down DNA strands, cause chromosome aberrations and break down the blood-brain barrier, thereby permitting toxic proteins to invade the brain," stated the original class-action complaint.

The attorney for the plaintiffs, Terrance Buehler, submitted a voluntary dismissal nearly one year after the initial filing. Buehler said in a later interview that he realized the litigation

Gilbert at Lakehead University is among those taking that stance. He said that he would need to see research that showed that such effects were not happening or that these effects could be prevented.

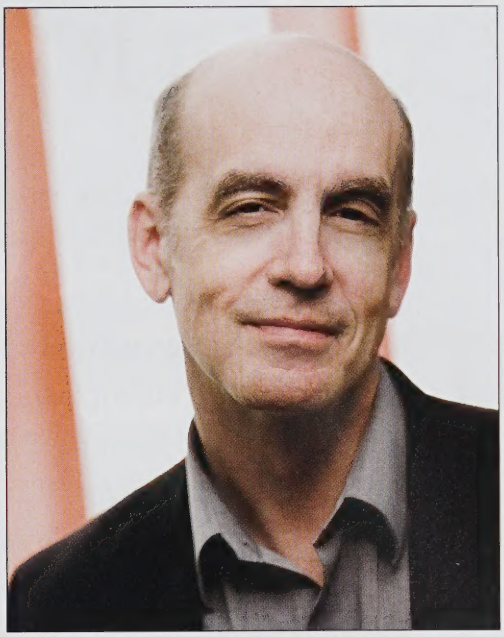
Dr. Erdreich of Exponent speculated as to why the EMR Network and others remain skeptical, despite contrary arguments from various international bodies.

"I think that the reason why there are differences of opinions is because people are looking at single studies and not at the whole picture," Dr. Erdreich says. "[IEEE's] committee completed a standard in 2005. They did not find that there was evidence to make them change the standard. Other organizations [like the EMR Network] have done reviews of the literature, but [IEEE and others] have looked at the research collectively. You have to look at the flaws in the studies, because no study is perfect and no study stands alone." MW

c'mon, carriers.

join the party—or get left behind

by Gary A. Bolles



SCOTT LOWDEN

It seems like a heady time for Internet service in America. Telephone companies are talking about running fiber to the home. Cable companies have announced increased access speeds on their networks. And wireless carriers are delivering video using "third generation" services such as EV-DO.

Except that we've heard this all before, a decade ago. Remember Tele-TV? That was the ill-fated "convergence" play by Bell Atlantic, Nynex, and Pacific Telesis—and run by Howard Stringer, now Sony's CEO. At one point, Bell Atlantic even promised a million homes would be run for fiber in a year—the year being 1996. I used to be editorial director of *Interactive Week*, a magazine that chronicled the rise of the Internet ecosystem. We regularly ran articles about the hype being generated by the telcos, and the cluelessness of the cablecos. Turned out both were clueless, dragging their feet on deploying DSL and cable modems out of fear they'd cannibalize their voice businesses. They eventually got on the bandwagon, but not before fighting at every step to keep upstarts like Covad from offering Internet service over their existing lines.

If you didn't know the history, you'd think the telcos and cablecos had invented Internet access. Today, U.S. media reports trumpet that consumer DSL and cable modem "broadband" subscriptions have increased 40 percent in the past year, to 84 million U.S. residents, according to the Pew Internet & American Life Project. But that doesn't mean that today's consumer services are competitive with what's going on outside the U.S. In fact, broadband access is far less ubiquitous than these rosy statistics would indicate. Sure, 70 percent of households making more than $75,000 per year have service. But only 31 percent of African-American families do. Face it, the current access rate is still abysmal.

The other issue is bandwidth. Compare the measly sub-megabit service of a common U.S. DSL connection to, say, Korea's blistering average (depending on whose report you read) 8-20 megabits per second. There's an old joke that the issue isn't whether a singing dog can sing well—it's that he can sing at all. Net access in the U.S. barely qualifies as humming a few notes. But so long as the media continue to call such poky speeds "broadband," we're slapping lipstick on an extremely slow and unresponsive pig.

Wonder why we focus so much on wireless? Just as the old fixed-line model of yesteryear was broken, today's wireless model of fixed cellular networks and per-minute charges is fundamentally broken. Calling new "next-generation" services like EV-DO "broadband" is just more inexpertly applied lipstick. Yet some incumbent providers have reacted so negatively to emerging muniwireless networks, they've sponsored legislation to kill it.

Sure, a few incumbents have recently bid on muniwireless RFPs. But the common rhetoric is that either the existing infrastructure is sufficient to meet consumer demand, or that municipalities shouldn't have the ability to anoint new competitors. Given the current state of Internet access both arguments are fundamentally flawed.

The incumbents need to stop fighting, and learn to love wireless. Municipal broadband networks actually represent more opportunity than threat. WiFi public access points, WiMAX backhaul, and incumbent wireless, wireline and fiber infrastructure can all work together as a single fabric, erasing pockets of isolation and creating more nimble networks. That means more potential opportunity for the incumbents, if they can open up their networks to higher performance and better services.

C'mon, folks. It's time to stop sitting on the sidelines. Come join the party. We're building the world's next-generation infrastructure: There's plenty of opportunity for everyone. **MW**

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consumer's choice?

not this legislation by Harold Feld

This month, the Senate Commerce Committee is considering a bill introduced and supported by chairman Ted Stevens (R-Alaska) to rewrite federal communications laws. While the "Consumers' Choice and Broadband Deployment Act of 2006" (CCBDA) contains a valuable provision opening new spectrum for unlicensed use, other provisions of the bill make it impossible to support if you care at all about municipal broadband.

Title V of the CCBDA—titled "Municipal Broadband"—would impose restrictions on the ability of state or local governments to offer broadband services. It explicitly encourages "public-private partnerships" awarded through an open bid process. Under any other process, however, the "public provider" must first solicit bids from private companies in the area. Even if there are no bids, the public provider must give access to any physical facilities, such as trenches dug in the right of way, "under the same terms" as the public provider gives itself. This is an enormous subsidy to private industry and a huge disincentive to any local government trying to maintain regulation of its rights of way while providing service to local residents and businesses.

The CCBDA explicitly pre-empts any state law. That may give new options to government entities in a state such as Nebraska, which has a full ban on municipal broadband, but it effectively prevents local governments elsewhere from providing the services they want to provide. The CCBDA would grandfather existing systems, and would exempt systems intended exclusively for public safety use.

Essentially, the CCBDA enshrines the "Pennsylvania model" of regulation, whereby governments can only provide broadband when no private sector company will provide service. Partnerships such as those between Philadelphia and EarthLink could go forward, but any other form of municipal broadband would remain subject to a private-sector veto or, at the very least, require the local government to provide significant subsidies to the private sector. The CCBDA justifies these provisions as protecting private providers from "undue government competition."

In many places, however, governments want to provide broadband service because their local market desperately needs competition. As many localities have discovered, having a single broadband provider or a cable/DSL "duopoly" can mean high prices, poor service and slow or uneven rollouts. Municipal entry, or even the threat of municipal entry, can force providers to put more effort into serving customers and lowering prices. More important, local governments need flexibility to tailor broadband solutions that work for their communities. A public-private partnership may work in Philadelphia or San Francisco, but may not work somewhere else. Trying to force all state and local governments into one model simply to prevent "undue competition" makes little public policy sense.

The Senate Commerce Committee will have the opportunity to amend the CCBDA before voting on whether to send it to the full Senate for consideration. Last year, Senators John McCain (R-Ariz.) and Frank Lautenberg (D-N.J.) introduced the Community Broadband Act, which would pre-empt state restrictions on municipal broadband without imposing the liabilities included in the CCBDA. Hopefully, the Commerce Committee will amend the CCBDA to adopt the language from the McCain-Lautenberg bill.

What can you do? Call your Senators and tell them to back the McCain-Lautenberg bill rather than the Stevens Bill. Hopefully, the Senate will hear from enough supporters of municipal broadband to recognize the changes it needs to make when it considers the CCBDA. MW

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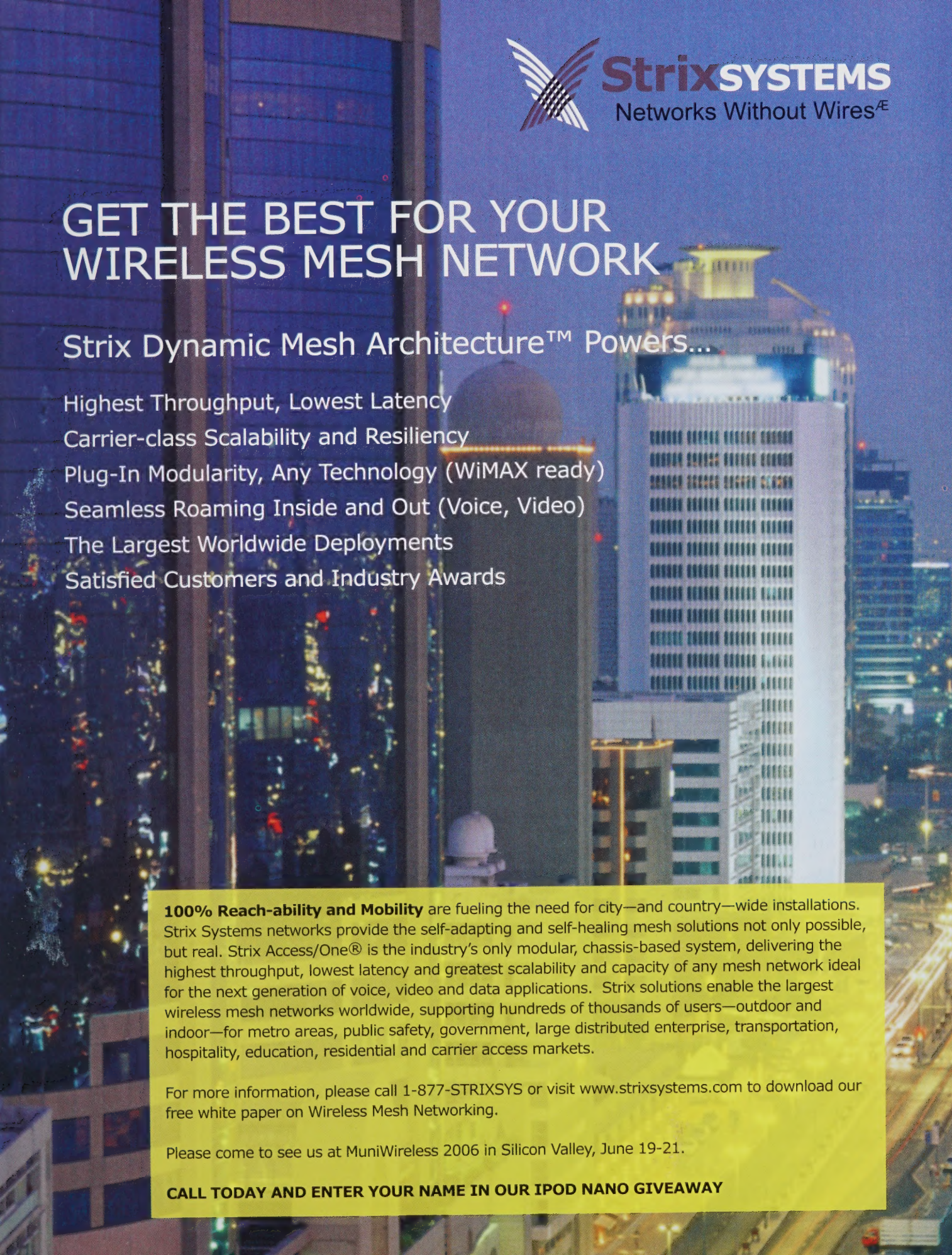
SCOTT LOWDEN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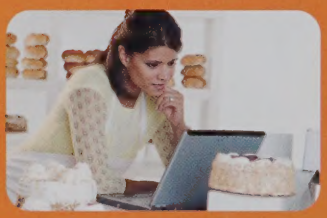

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